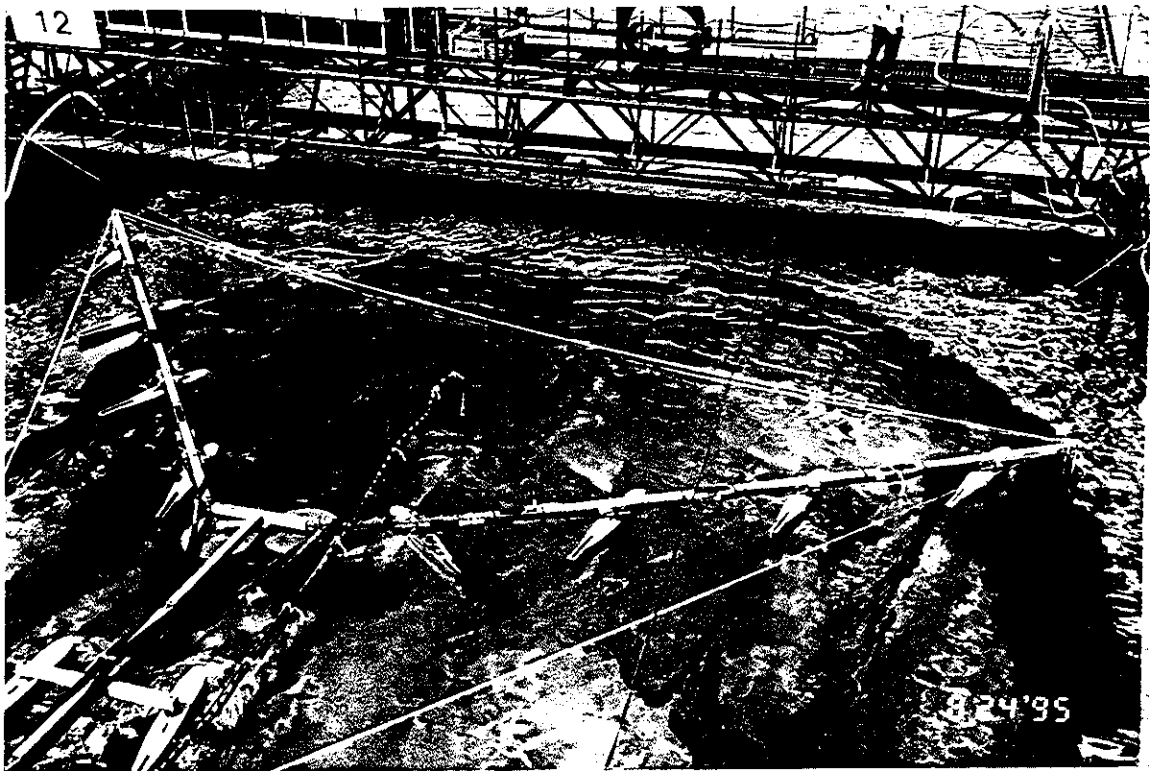


# Ohmsett Tests of The Water Jet Barrier System

**FINAL**

**August 1996**



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# **1 INTRODUCTION**

## **1.1 Background**

A high pressure Water Jet Barrier system has been under development by Environment Canada and The Minerals Management Service between 1979 and present. On previous occasions the Water Jet Barrier has been evaluated for general flotation and control characteristics. Additional testing was also performed utilizing 12 gallons (46 Liters) of canola oil. As a result of prior testing, modifications have been made to the system and reevaluated at the Ohmsett facility. The tests objectives at Ohmsett included determination of advancing speeds and oil containing ability for three surface conditions. The tests at Ohmsett were performed from 8/20/95 through 8/25/95, included setup time, actual testing, dismantling, clean up and packing the system for transport.

## **1.2 General Description of the Water Jet Barrier**

The Water Jet Barrier consists of three beams in a Y configuration on which floats are mounted for buoyancy. A series of nozzles are mounted along the two forward beams which emit flat fan-shaped, high velocity jets of water horizontally about 15 to 30 cm above the surface of an oil slick. The nozzles are spaced so that the sprays overlap to create a continuous spray front. A series of opposing nozzles are mounted on the "back" side of the barrier to balance the thrust from the forward nozzles. The flow to the forward and back nozzles is separately controlled, thus providing the Water Jet Barrier with maneuverability in the field to suit local conditions (e.g., to respond to changes in winds, spill conditions, or tidal currents). High pressure (1500 psi) water is provided by the pump system located on a support vessel to the control manifold. The pump system is diesel powered with a manual clutch between pump and engine, and requires an operator during use. The valves at the control manifold permit the operator to drive the Water Jet system forward, left, right or in reverse via nozzle thrust. High pressure umbilical hoses supply the Water Jet nozzles directly from the control manifold.

# **2 TEST SETUP AND PARAMETERS**

## **2.1 Tank Configuration**

The Water Jet Barrier sections were manually lowered into the test basin and assembled from the work boat. Environment Canada technicians, experienced with the barrier, coordinated and executed the assembly with the assistance of Ohmsett technicians. Figure 1 illustrates the Water Jet system as configured in the test basin. The main pump/power unit was lifted by crane and placed at the north-west corner of the main bridge. The 4-way control manifold was located near the center of the main bridge with high pressure supply and discharge lines appropriately attached. Three guide lines were installed across each of the barrier boom tips to maintain the Y configuration. Slack lines were attached to the forward boom tips and affixed diagonally across to the auxiliary bridge. These lines were to prevent collision with the basin walls in the event of loss of control. The guide lines were installed not to impact directional control or speed capabilities.

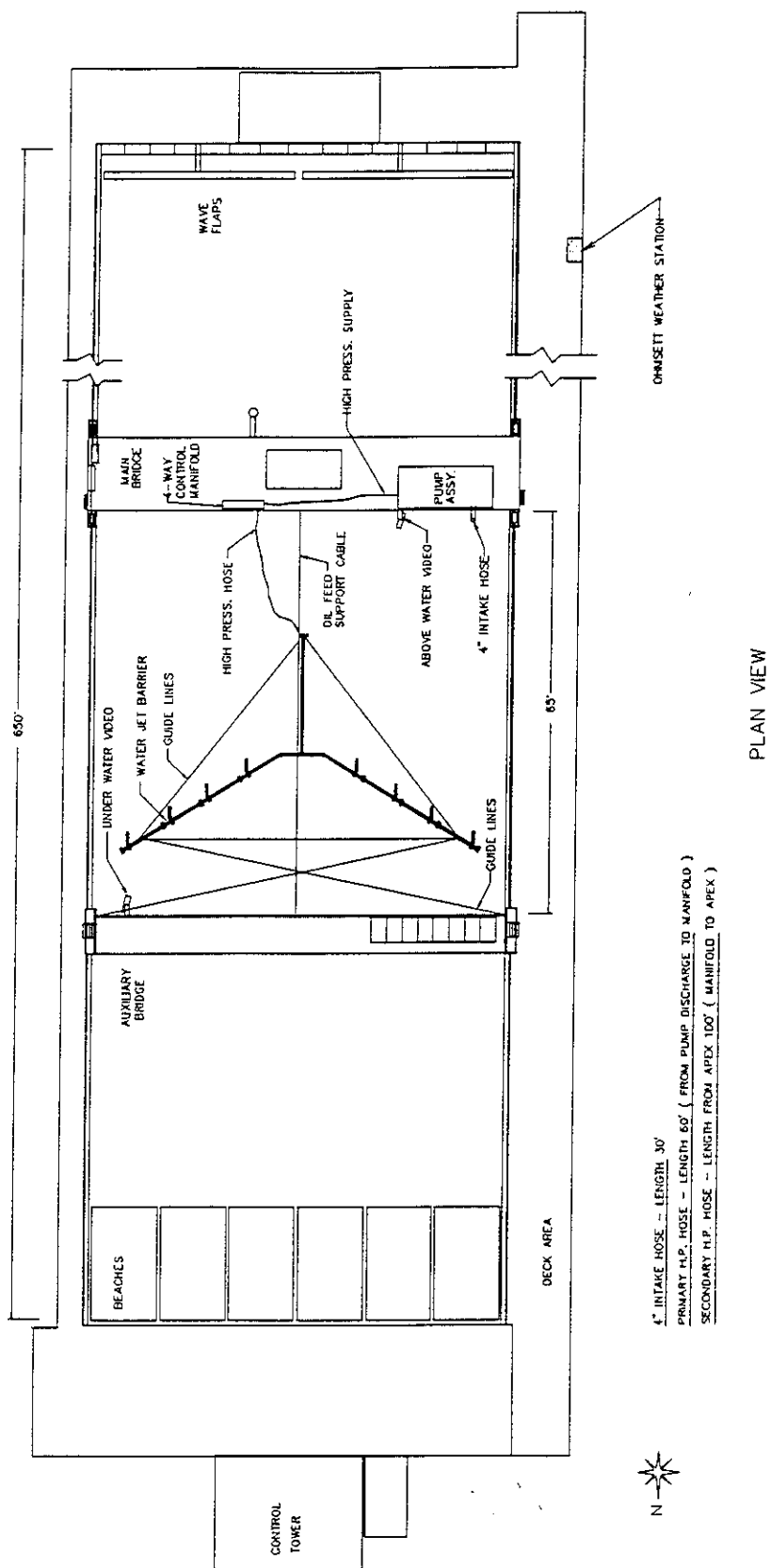


Figure 1. Water Jet Barrier Test Setup

## 2.2 Test Fluids

One test oil was used during this test series, refurbished Hydrocal 300, which is a refined naphthenic oil with a test viscosity of 300 centipoise. The test oil has been analyzed at the Ohmsett laboratory and the values posted are an average of four samples analyzed at 25°C. The oil analyses and properties, as well as the basin water properties are listed in Appendix A.

## 2.3 Wave Conditions

Three basin surface conditions were utilized during the Water Jet Barrier testing: calm, a regular wave chosen by Environment Canada, and sea state 2 waves. The regular wave is a single frequency sinusoidal wave in which wave-dampening beaches were used to minimize reflective waves. The sea state 2 wave condition is a variable frequency wave which is allowed to generate for 15 minutes prior to the test runs in which no beaches are employed allowing reflective waves to develop. The wave analysis results are provided in Section 3, Table 4, Ambient Conditions and Wave Analysis. The frequency and amplitude spectrums are included as Appendix B, Wave Frequency and Amplitude Spectrums.

## 2.4 Photo and Video Documentation

Three video cameras were used to document test runs and events which occurred. A fixed underwater and a fixed above water camera were implemented. Their locations are illustrated in Figure 1. The fixed location cameras recorded each test entirely. A portable video camera was also used to obtain footage from various bridge locations. As a result of high pressure jet streams being shot into the water, underwater camera visibility was poor.

A 15 minute video has been composed from the total footage obtained. The video illustrates the delivery, setup operation, advancing velocity tests and oil containment testing. Complete videos are on file at Ohmsett.

# 3 TEST DATA

This report provides the recordable data obtained during the completed test runs. Table 3, Water Jet Data, is an inclusive listing of the original test matrix that was scheduled to be performed. The matrix identifies the test number, date, time, type of test, Ohmsett data file name, surface conditions, volume of oil if applicable and advancing speed attempted. The ambient conditions during the test series have been recorded and provided in Table 4, Ambient Conditions and Wave Analysis. The actual advancing speeds (equivalent to main bridge speed) obtained during the test runs have been plotted as Figures 2 - 11. Water Jet Barrier system pressures were manually obtained at the high pressure supply line and the control manifold valves and are listed in Table 5, Water Jet Barrier System Pressures. These readings were obtained with the system speed constant when possible. The system pressures varied during the tests with speed and stirring adjustments.



## **4 RESULTS**

The test data presented in this report is limited to the quantitative values obtained during the test in the form of manually and computer recorded data. Evaluation of the Water Jet Barrier performance was determined primarily in a qualitative manner as a result of this testing. Environment Canada, as sponsors of the test and operators of the equipment during the test, will be preparing a separate report based on system performance requirements, observations and the provided data.

## **5 TEST QUALITY**

Test quality is the active application of the Ohmsett " General Quality Procedures and Documentation Plan Manual ". This plan has been implemented by means of a " Quality Assurance CheckList ". This checklist includes those items in the test plan that are deemed important elements in creating a quality test. This list was used by the QC Officer and is included in Appendix C.

As part of the quality test plan , a check was performed to ensure that data was available to show the initial source of calibration data for each piece of instrumentation used in the test. Pre- and post-test checks were performed on the instrumentation on a daily basis, the first check being performed before the test day started and a second check at the conclusion of the test day. The results yielded that the quality and accuracy of the data obtained was within the calibration limits.

**Table 3. Water Jet Data**

TEST	DATE & TIME	TEST TYPE	SPEED ATTEMPT	OHMSETT FILE(.PRN)	SURFACE CONDITION	NOTES
1	8/23/95 1:04 PM	SPEED TEST	0 - 0.5(kt)	WTRJET1	CALM	OPER. TO MATCH BRIDGE SPEED
2	8/23/95	-----	0 - 1.0	WTRJET2	CALM	OPER. TO MATCH BRIDGE SPEED
3			0 - 1.5		CALM	SPEED REACHED DURING TEST 2
4	8/23/95 2:45 PM	-----	0 - 2.0	WTRJET3	CALM	GUIDE ROPE FAILURE, REPAIRED AND TEST REPEATED AS 4A
4A	8/23/95 3:51PM	-----	0 - 2.0	WTRJET4	CALM	ABORTED, POWER PACK MISADJUSTED, REPEATED AS 4B
4B	8/23/95 4:13 PM	-----	0 - 2.0	WTRJET5	CALM	OPERATOR TO MATCH BRIDGE SPEED
5			0 - 2.0+		CALM	SPEED REACHED IN TEST 4B
6	8/24/95	-----	0 - 1.0	WTRJET6	REG	OPERATIONAL PROB, TEST REPEATED AS 6A & 7A
7	8/24/95		0 - 1.5		REG	TEST COMBINED WITH TEST 6
6A & 7A	8/24/95	-----	0 - 1.5	WTRJET7	REG	OPERATOR TO MATCH BRIDGE SPEED
8			0 - 2.0+		REG	SPEED REACHED IN TEST 6A & 7A
9	8/24/95	-----	0 - 1.0	WTRJET8	SS-2	ABORTED - CONDITION TOO SEVERE
10			0 - 1.5		SS-2	CONDITION TOO SEVERE
11			0 - 2.0+		SS-2	CONDITION TOO SEVERE
12	8/24/95	OILCONT. 40 GAL.	VAR	WTRJET9	CALM	OBTAIN LOSS SPEED (.5 - 1.0)
12A	8/24/95	140 GAL	VAR	WTRJET10	CALM	OBTAIN LOSS SPEED (.5 - .75 )
13	8/24/95	100 GAL	VAR	WTRJET11	REG	SYSTEM FAILURE, TEST REPEATED AS 13A
13A	8/25/95 8:25 AM	100 GAL	VAR	WTRJET12	REG	
14			VAR		SS-2	NOT PERFORMED
15			VAR		CALM	-----
16			VAR		REG	-----
17			VAR		SS-2	-----

**Table 4. Ambient Conditions and Wave Analysis**

TEST	WIND SPEED/DIR (mph/deg)	TEMP AIR/WATER(°f)	WAVE ANALYSIS H1/3 (in), PERIOD(sec)
1	2.4 / 48	75.5 / 79	CALM
2	3.8 / 53	76.5 / 79	CALM
4	4.0 / 71	77.8 / 79	CALM
4A	6.4 / 97	78.6 / 79	CALM
4B	6.4 / 97	78.6 / 79	CALM
6A & 7A	12.7 / 270	81.4 / 78	REG - 4.6, 3.8
9	12.7 / 270	81.4 / 78	SS-2 - 11.12, NA
12	12.6 / 301	89.7 / 78	CALM
12A	12.6 / 301	89.7 / 78	CALM
13A	9.9 / 14	81.2 / 77	REG WAVE - 7.1, 3.5

**Table 5. Water Jet Barrier Control Manifold Pressures**

TEST	P in (psi)	P 1 (psi)	P 2 (psi)	P 3 (psi)	P 4 (psi)	POWER PACK RPM
1	875	850	850	450	650	1450
1	875	900	900	450	750	1500
2&3	875	900	900	650	700	1500
2&3	850	800	800	700	700	1500
4B	1000	1000	1000	1000	1000	1750
4B	1300	1200	1200	1200	1200	2000
6A	700	850	850	600	600	1500
6A	700	750	750	750	700	1500
12	850	800	800	550	750	-----
12A	900	750	900	600	1000	-----
12A	800	800	900	700	850	1600
13A	-----	900	900	700	900	-----

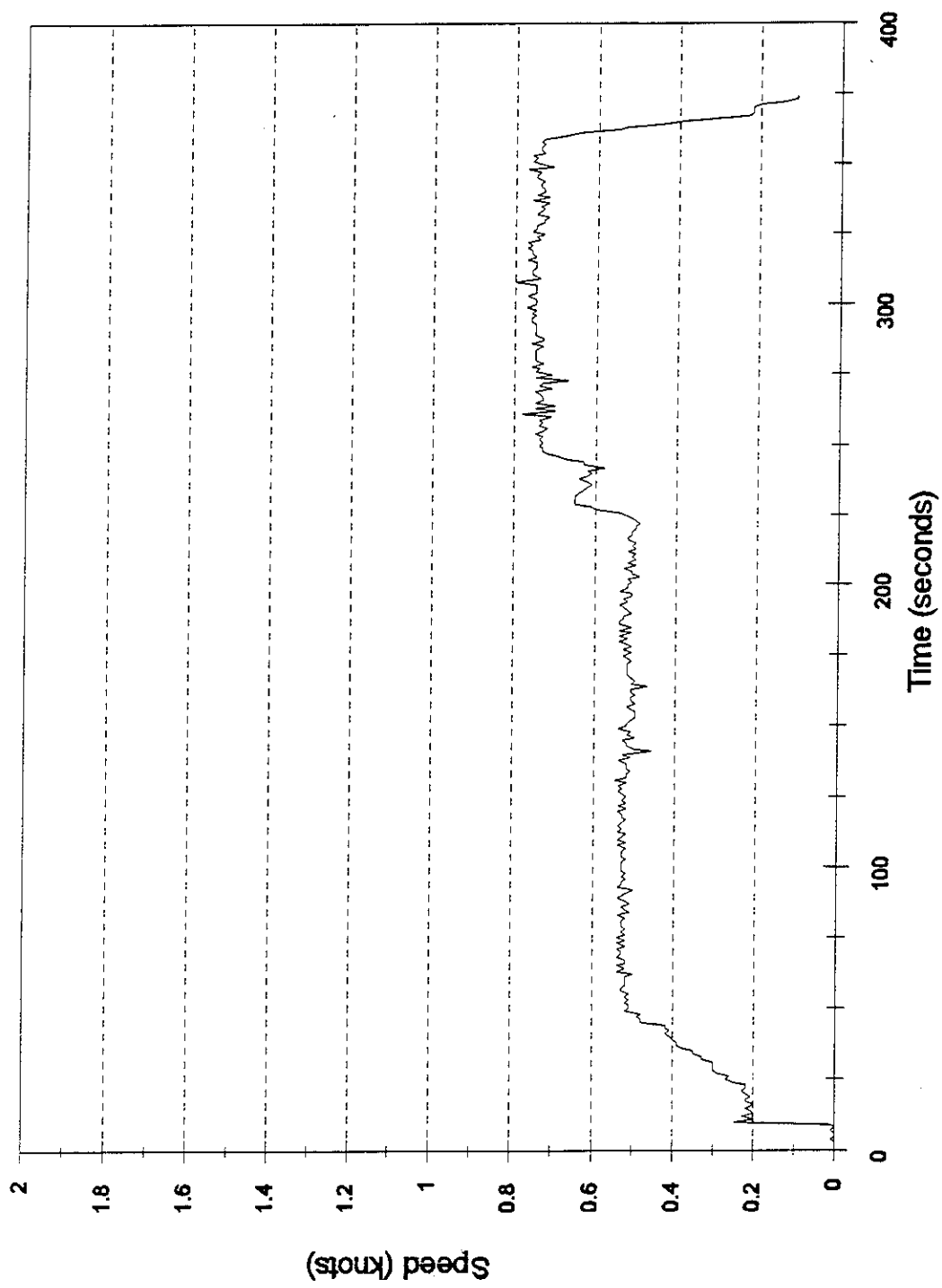


Figure 2. Speed Test - Test #1

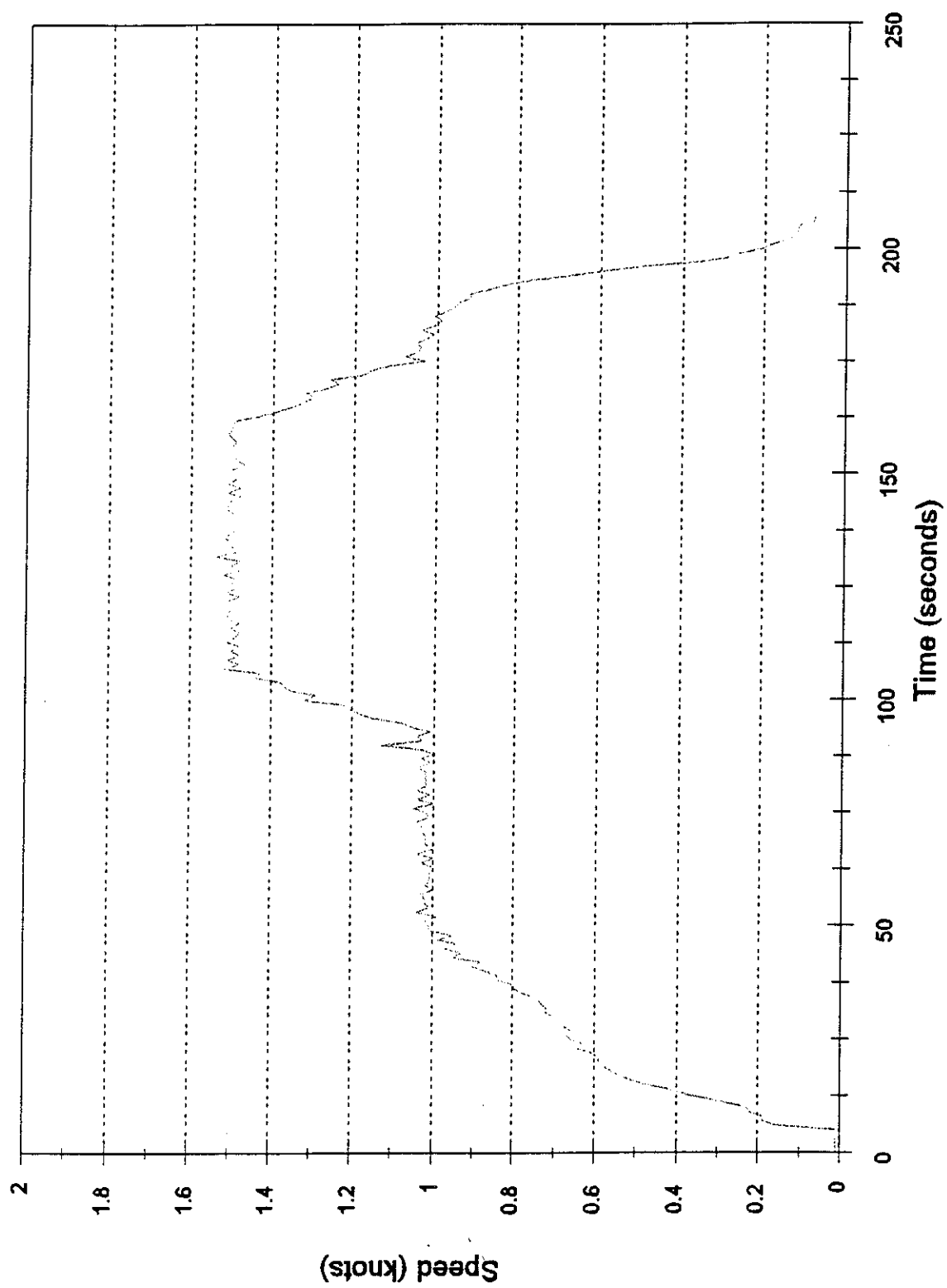


Figure 3. Speed Test - Test #2

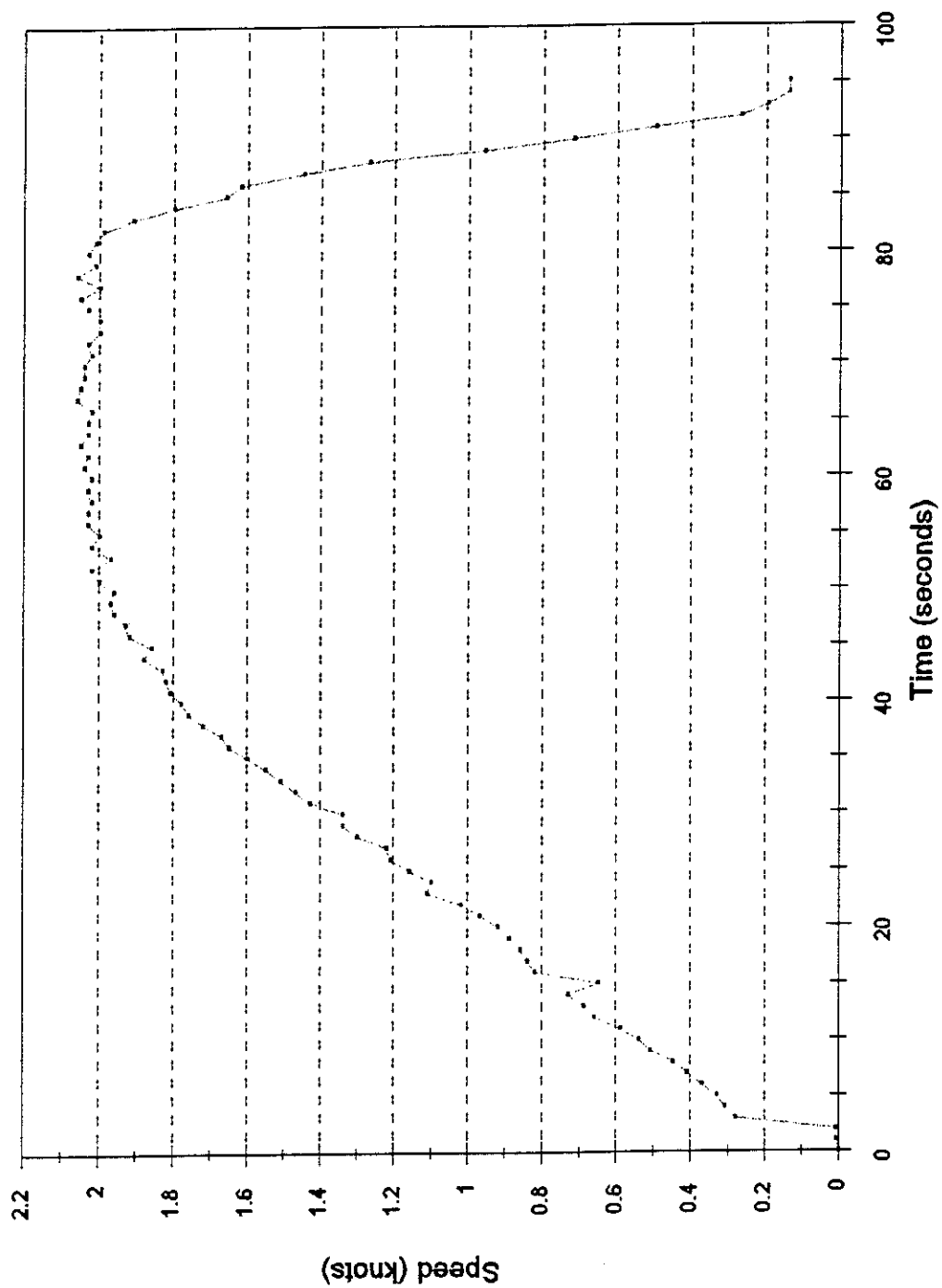


Figure 4. Speed Test - Test #4

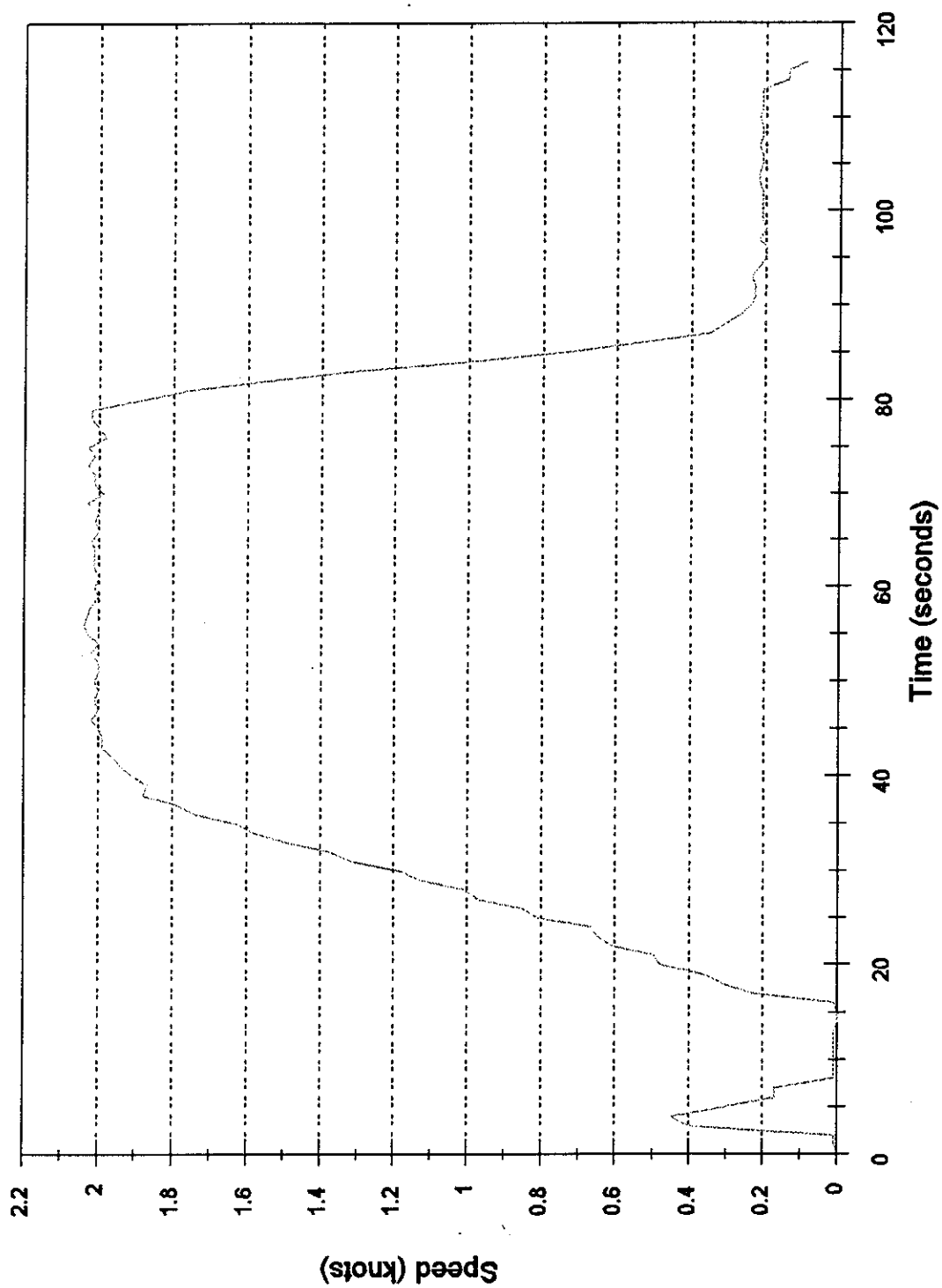
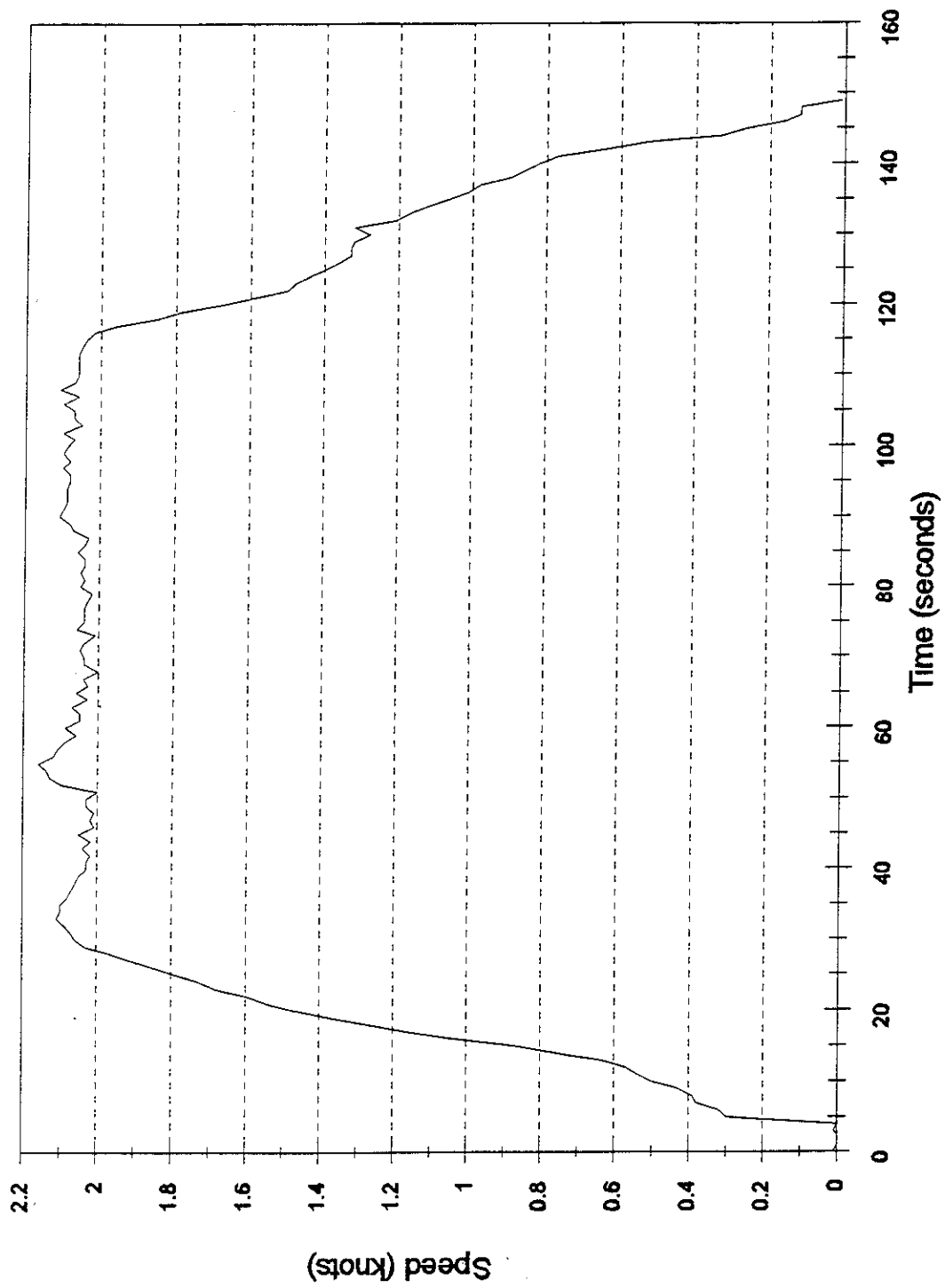


Figure 5. Speed Test - Test # 4A



**Figure 6. Speed Test - Test #4B**



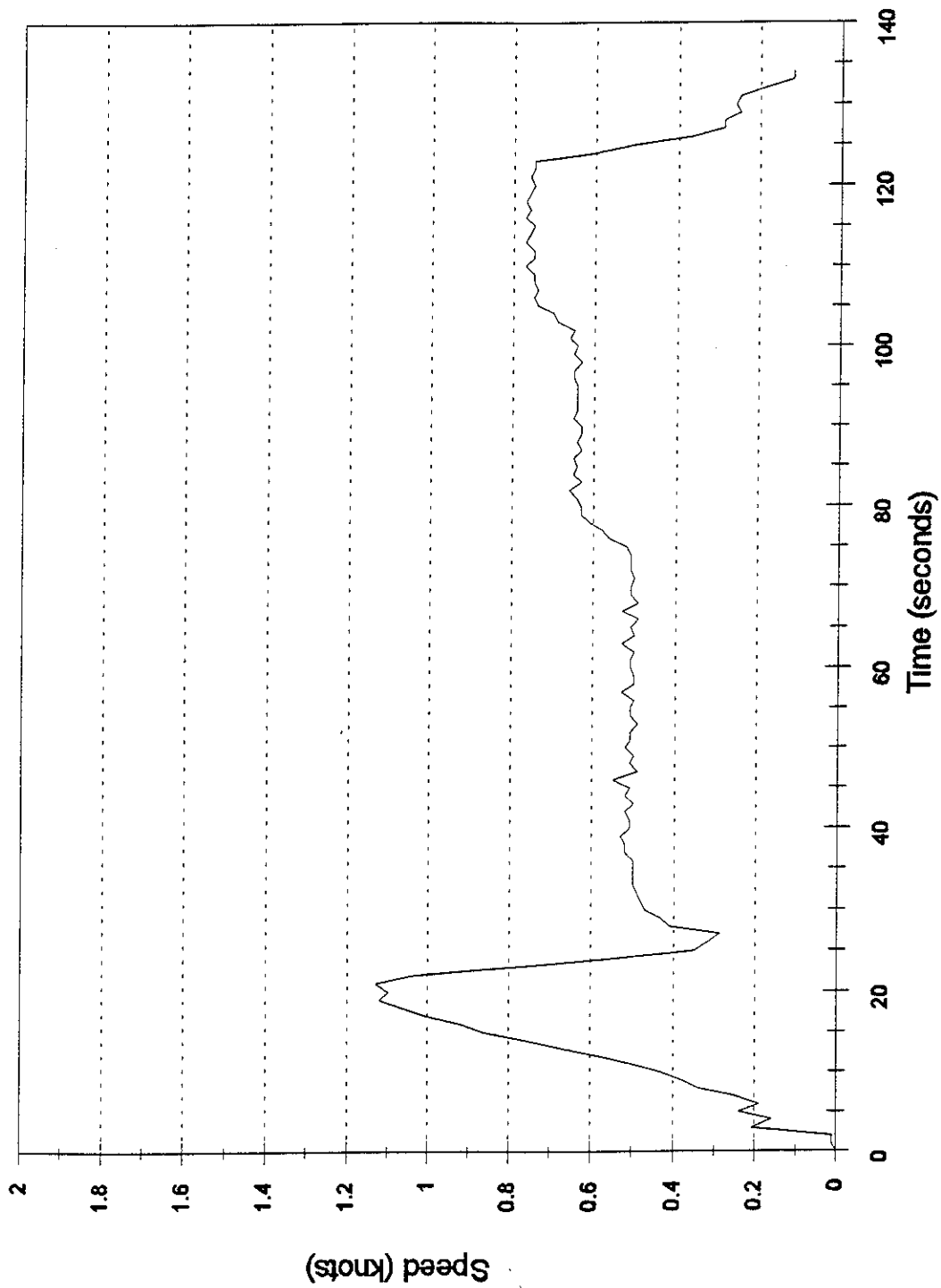
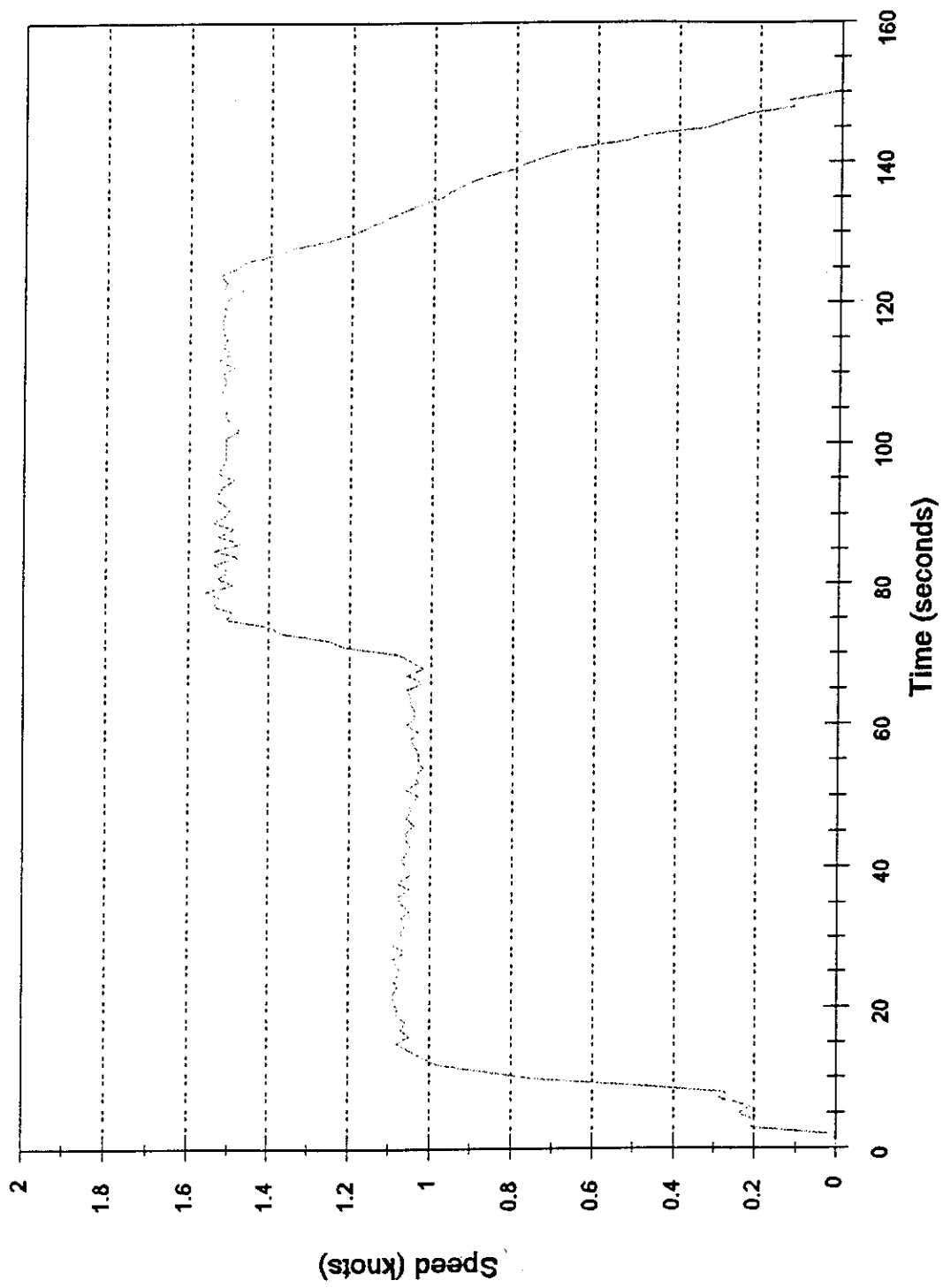


Figure 7. Speed Test - 6 & 7



**Figure 8. Speed Test - 6A & 7A**

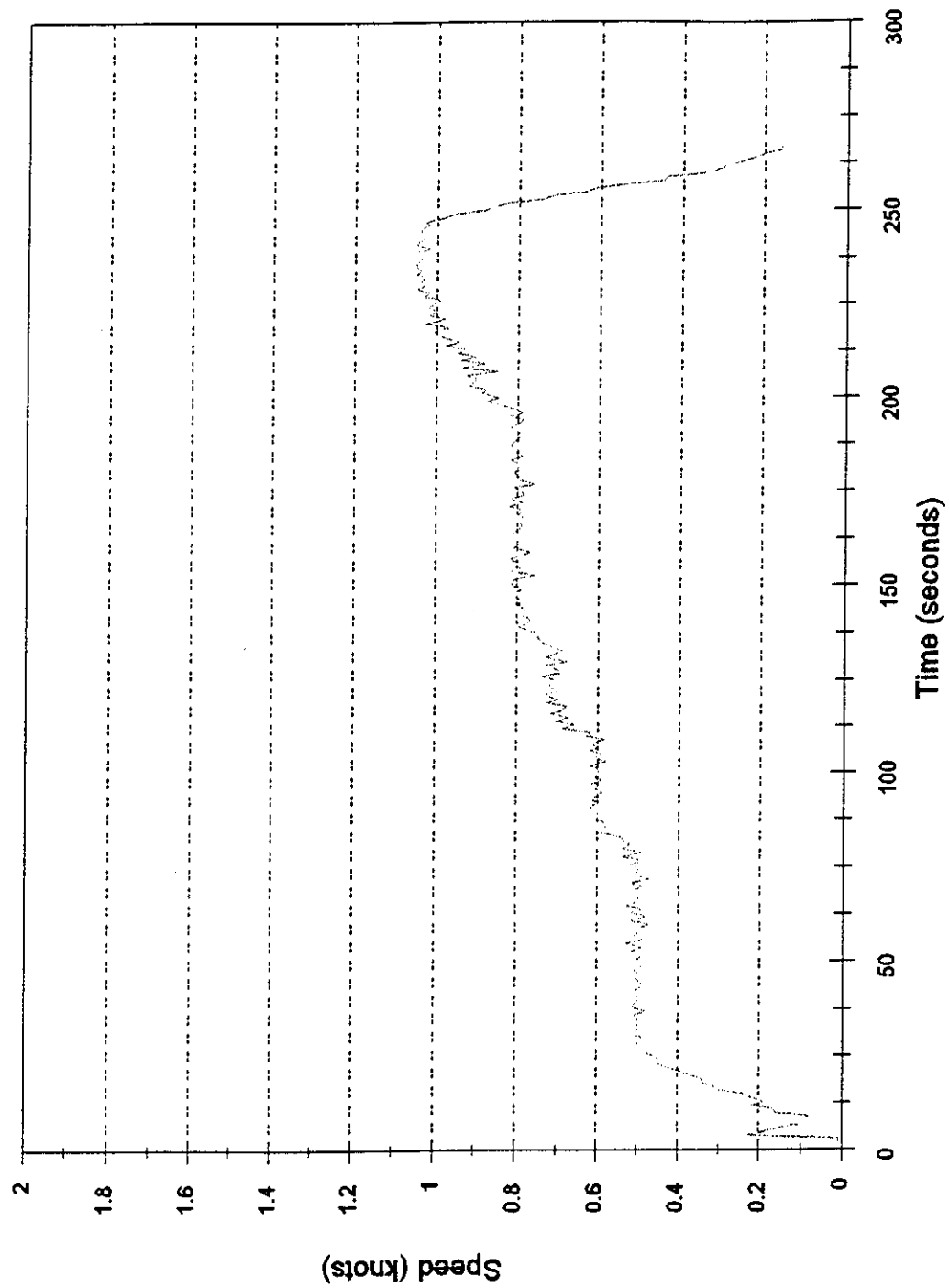


Figure 9. Oil Containment - Test #12

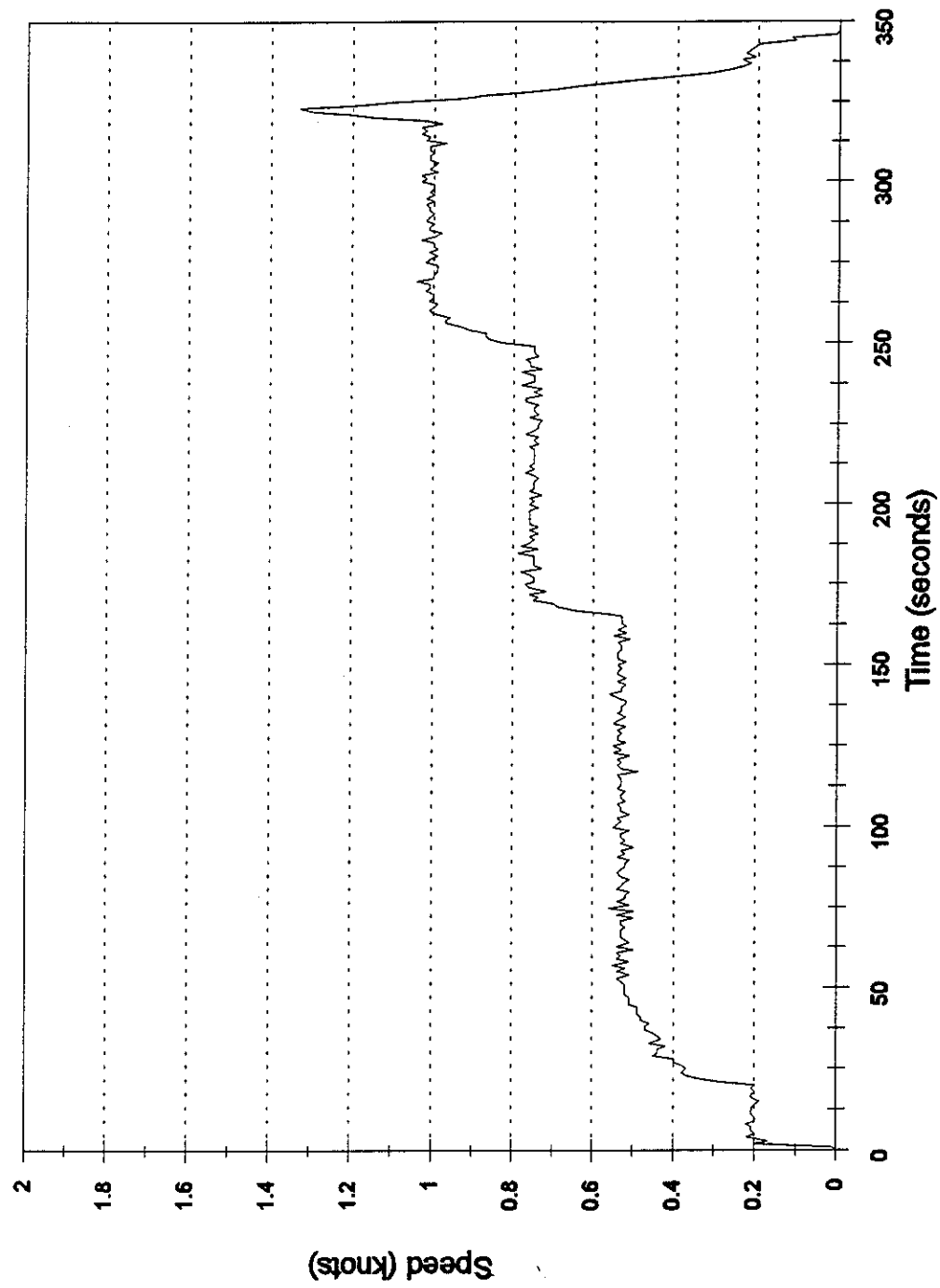


Figure 10. Oil Containment - Test #12A

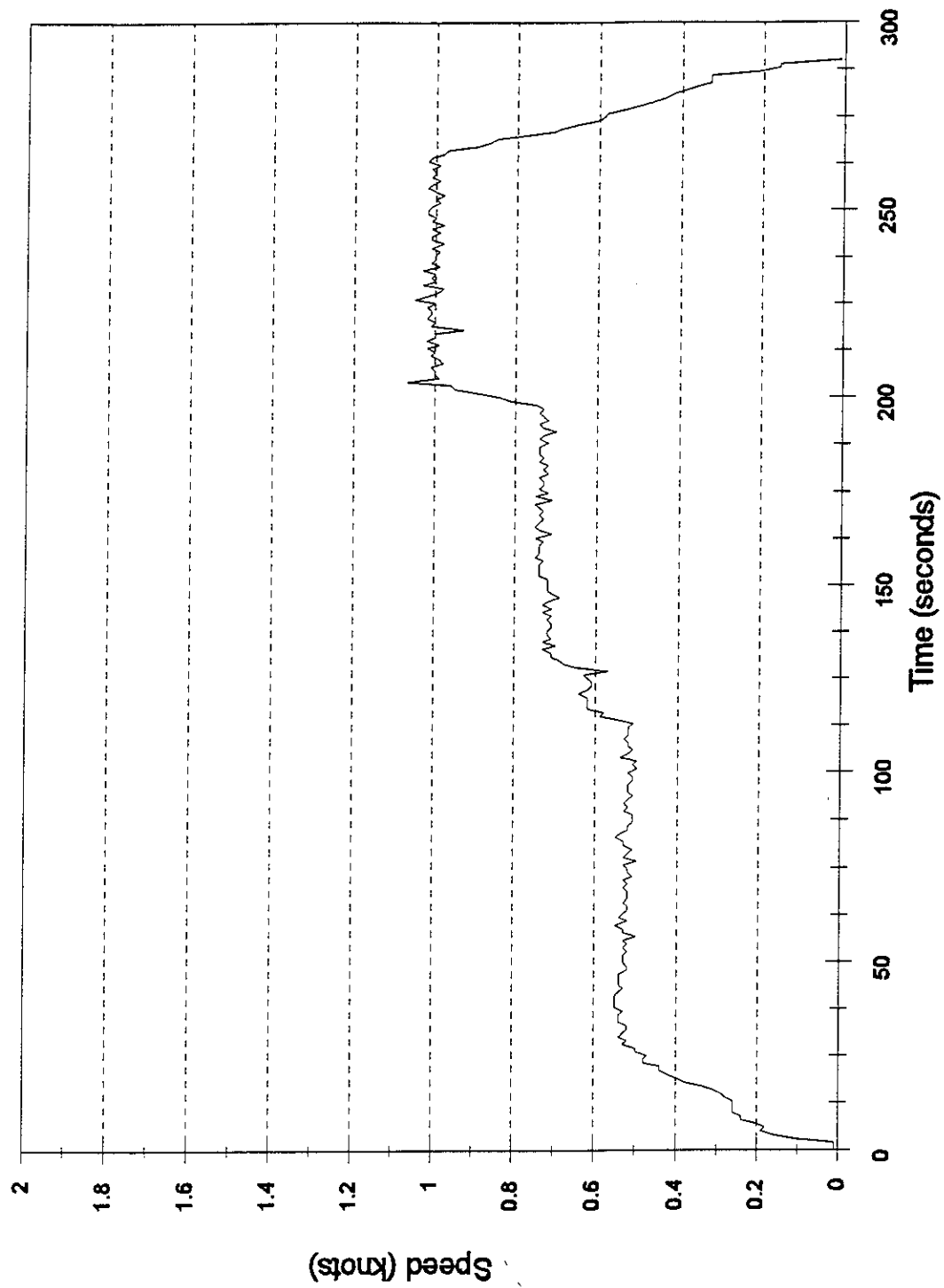


Figure 11. Oil Containment - Test #13A

## APPENDIX A Fluids Testing

The measurements made in the chemistry laboratory at the Ohmsett Facility are as follows:

1. VISCOSITY (ASTM D2983)

Viscosity is measured using a Brookfield Engineering Model LV Viscometer. The samples are collected in 600 ml beakers, the contents are cooled to 50°F (10°C), then the temperature is raised to 140°F (60°C) using a Brookfield Constant Temperature Bath. Viscosity measurements are made every 50°F (10°C), yielding a temperature vs. viscosity curve for each sample collected. This is done to find the viscosity at variable test temperatures as is found in the test tank.

2. SURFACE & INTERFACIAL TENSION (ASTM D971)

Surface and interfacial tensions are measured with a Fisher Scientific Tensiomat. Approximately 50 mls of oil is needed to determine both surface and interfacial tensions. Measurements are made under standardized nonequilibrium conditions in which the measurement is completed one minute after formation of the interface.

3. SPECIFIC GRAVITY (ASTM D1298)

This analysis is performed using the hydrometer method. The oil sample is transferred to a 500 ml cylinder, the appropriate hydrometer is lowered into the sample and allowed to settle. The hydrometer scale is read and the temperature is recorded.

4. WATER AND SEDIMENT IN PETROLEUM (ASTM D1796)

A recovered oil sample of approximately 100 mls is mixed with an appropriate solvent (toluene), heated to 140°F (60°C), and rotated at 2000 rpms in a centriufge for 15 minutes. The amount of water and sediment is measured and the percentages calculated from the amount of sample used.

5. OIL AND GREASE IN WATER, TOTAL RECOVERBLE (INFRARED)

A 500 - 1000 ml water/oil sample is acidified to a pH less that 2.0 and the oil is extracted with carbon tetrachloride. The oil and grease concentration is determined by comparison of the infrared absorbance of the sample extract with standards, using a Shimadzu IR 435 Spectrophotometer.

### Test Oil Properties

Hydrocal 300 at 25°C				
Viscosity (cPs)	Specific Gravity	Interfacial Tension (dyne/cm)	Surface Tension (dyne/cm)	Bottom Solids & Water (%)
300 Std Dev. 7.0	.908 Std Dev. 0.000	20.3 Std Dev. 0.4	34.7 Std Dev. 0.2	0.3 Std Dev. 0.07

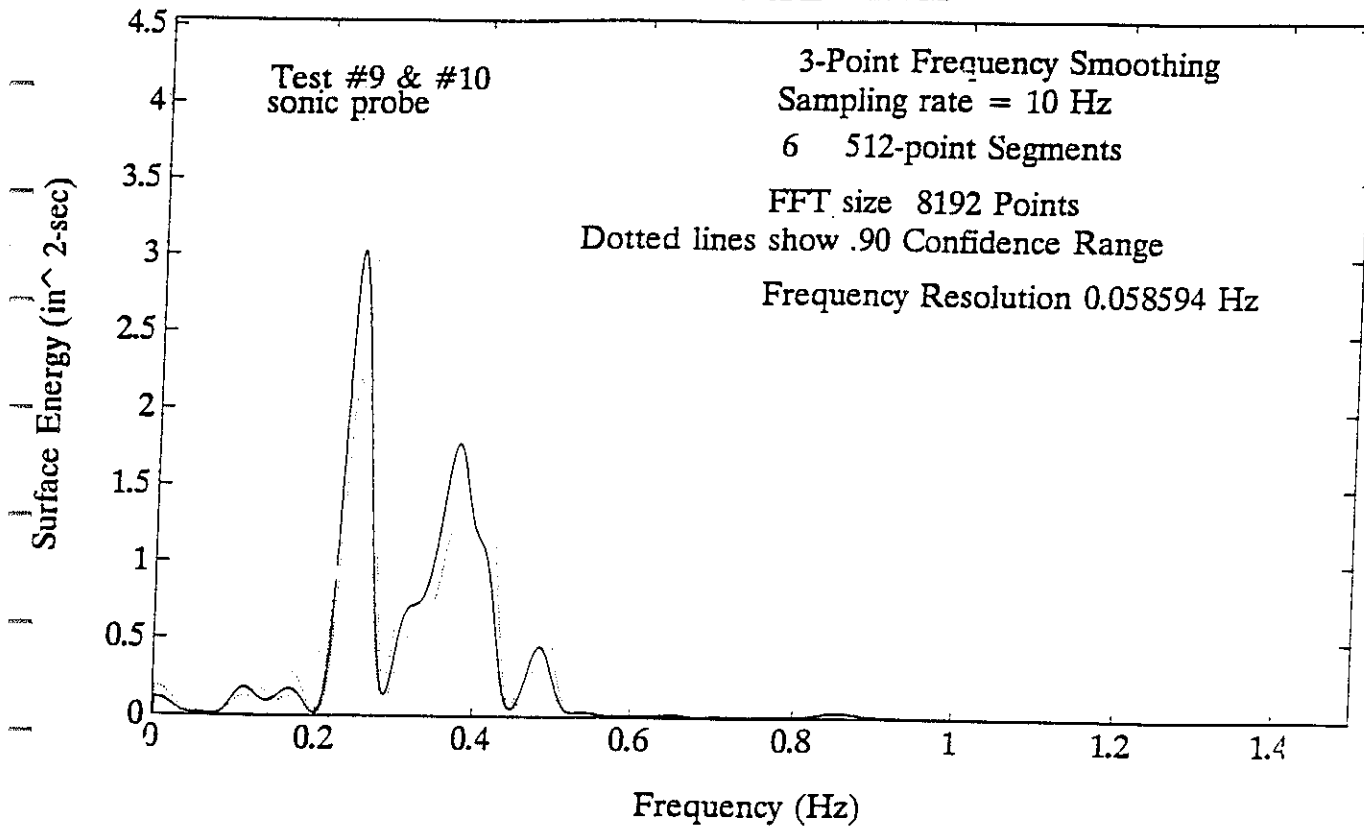
### Basin Water Properties

Salinity (ppt)	Turbidity (NTU)	pH
14.8 Std Dev. 0.0	0.1 Std Dev. 0.0	8.21 Std Dev. 0.025

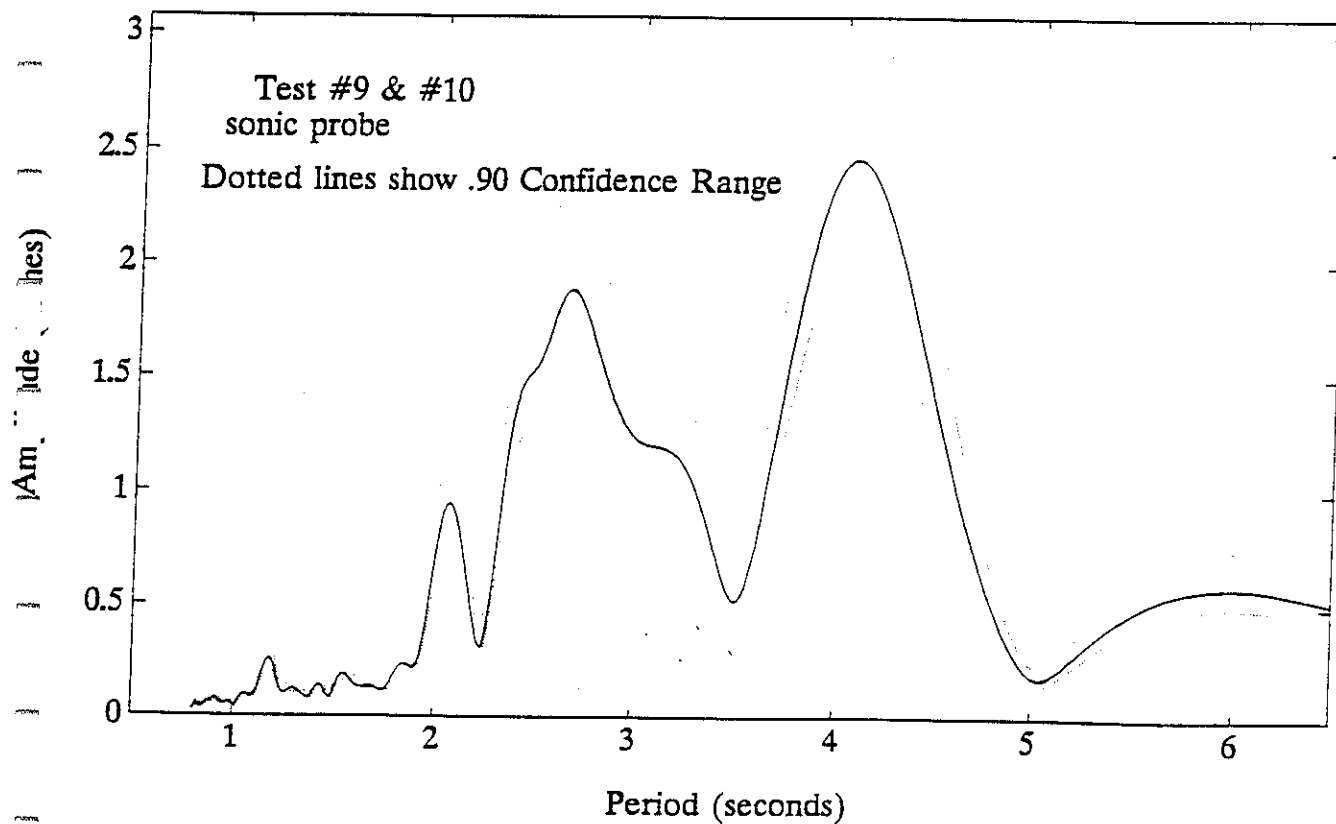


## **APPENDIX B Wave Frequency and Amplitude Spectrums**

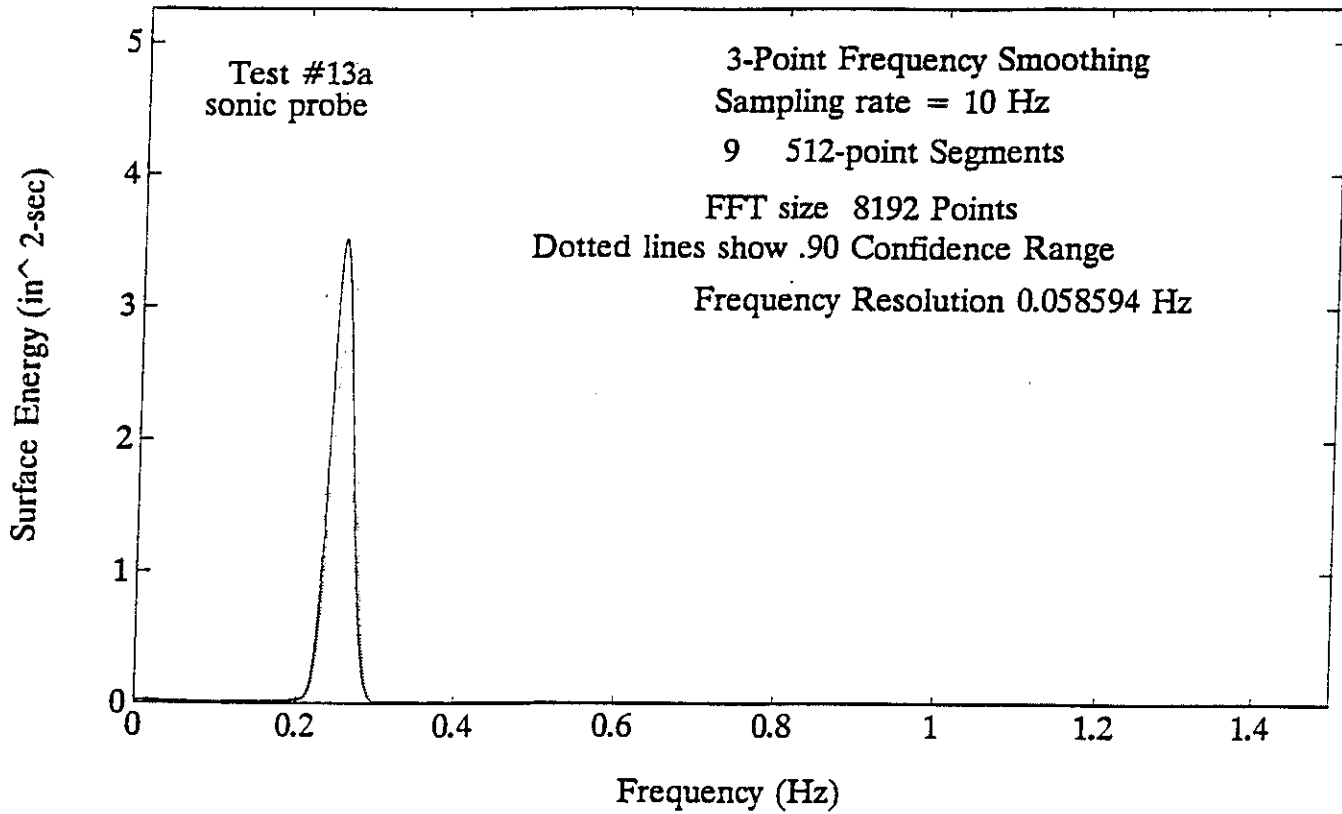
# ENERGY SPECTRUM



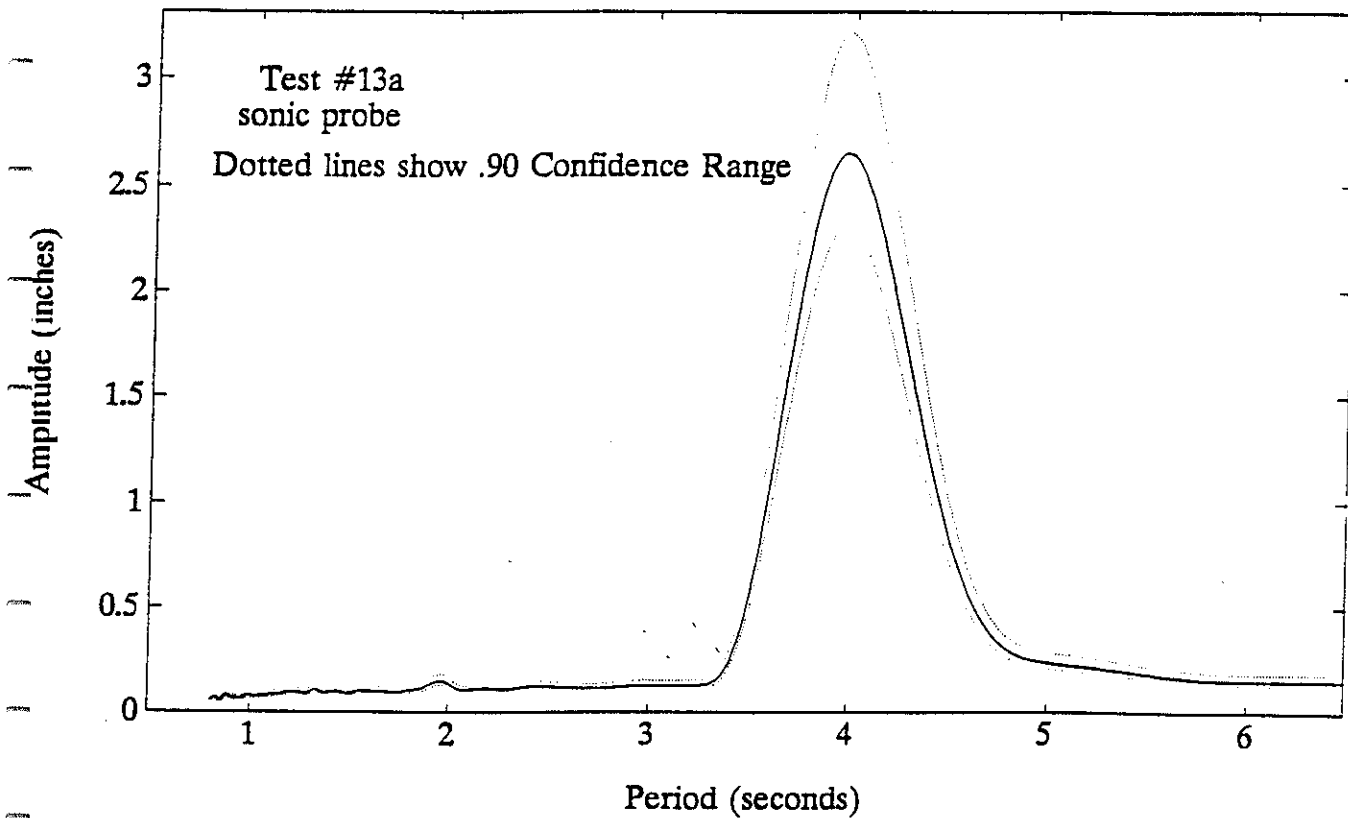
# AMPLITUDE SPECTRUM



## ENERGY SPECTRUM



## AMPLITUDE SPECTRUM



## **APPENDIX C Quality Assurance Checklist**

# QUALITY ASSURANCE CHECKLIST

PROJECT: Water Jet Barrier

PROJECT No: 915

Date: 8/23/95

PRETEST CONDITIONS:

1<sup>ST</sup> TEST DAY  
(DRY RUNS - CHECKOUT)

CALIBRATION CHECKS / VERIFICATION:

	<u>Calibrated</u>	<u>Verified By</u>	<u>Date</u>
Bridge Speed	<u>5/16/95</u>	<u>JLB</u>	<u>8/23/95</u>
Bridge distance	<u>5/16/95</u>	<u>JLB</u>	<u>8/23/95</u>
Wave frequency	<u>5/16/95</u>	<u>JLB</u>	<u>8/23/95</u>
Wave height probe	<u>5/5/95</u>	<u>JLB</u>	<u>8/23/95</u>
Oil tank level	<u>8/4/95</u>	<u>JLB</u>	<u>8/23/95</u>
Water Jet SPD (if used)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

WEATHER CONDITIONS

	<u>Time</u>	<u>Verified by</u>	<u>Date</u>
Air temperature	<u>AM 73.8°F</u>	<u>JLB</u>	<u>10:56 AM 8/23/95</u>
Water temperature	<u>AM 78°F</u>	<u>JLB</u>	<u>8:50 AM 8/23/95</u>
Wind speed	<u>AM 6 mph</u>	<u>JLB</u>	<u>8:20 AM 8/23/95</u>
Wind direction	<u>AM 37°</u>	<u>JLB</u>	<u>8:30 AM 8/23/95</u>
Water salinity	<u>AM 14.8 parts per thousand</u>	<u>JLB</u>	<u>8:30 AM 8/23/95</u>

	<u>Time</u>	<u>Verified by</u>	<u>Date</u>
Underwater Camera Operational	<u>8:30 AM</u>	<u>JLB</u>	<u>8/23/95</u>
Above Water Camera Operational	<u>8:30 AM</u>	<u>JLB</u>	<u>8/23/95</u>
Test Setup Per Test Plan	<u>10:15 AM</u>	<u>JLB</u>	<u>8/23/95</u>

WATER JET BARRIER QUALITY CHECKLISTDaily ChecklistDate 8/23/95 (if performed on various days, use separate checklist for each date)Pretest Conditions:\*

	<u>Air Temp.</u>	<u>Water Temp.</u>	<u>Wind Dir.</u>	<u>Wind Spd</u>
	<u>10:56 AM</u>	<u>8:30 AM</u>	<u>8:30 AM</u>	<u>8:30 AM</u>
Tank	<u>73.5°F</u>	<u>78.0°F</u>	<u>37°</u>	<u>6.7 MPH</u>

all by  
JLB 8/23/95

\* Indicate observation data, time, and individual recording date (initials)

Camera Operational:

	<u>Verified By</u>	<u>Date</u>	<u>Time</u>
Video:	<u>JLB</u>	<u>8/23/95</u>	<u>8:30 AM</u>
Still:	<u>JLB</u>	<u>8/23/95</u>	<u>8:30 AM</u>

Instrument Test Conditions:

<u>Instrument:</u>	<u>Verified By</u>	<u>Date</u>	<u>Time</u>
1. Bridge Speed	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
2. Bridge Dist.	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
3. Wind Speed	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
4. Wind Direction	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
5. Ambient Temp.	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
6. Tank Water Temp.	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
7. Tank Level	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
8. WH Sonic Probe	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
9. Wave CPM	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
10. Marker 1	<u>JLB</u>	<u>8/23/95</u>	<u>10:45 AM</u>
11. Pump RPM	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
12. Water Jet (FPM)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

# Test Conditions

	Data	Observed by	Time	Date
Bridge Speed	WTRJET 0.17N	JAC	10:47 AM	8/23/95

Note Measuring Method: VISUAL check of INSTRUMENTATION READOUT

9/5/95 JAC checked Computer speed against Computer DIST READOUT over a 100' Run DIST. The Computer speed MATCHED. See sheet in DIST OUT within .0023 knots when compared with the DIST READOUT against time.

# Water Pressure

	Data	Observed by	Time	Date
Meter Readings	WATERJET 1.17N	MIKE MURR	1:24 PM	8/23/95
Recorded				
234 MIKE				
ON 100' RUN				
BRING DURING				
Test JAC				

Note: Take Duplicate Samples for characteristics and run three Reps.  
(See comments on Section 2.1.6)

	Data	Observed by	Time	Date
Oil Used:	N/A	N/A	N/A	N/A
Quantity:	N/A	N/A	N/A	N/A

Wave Conditions:

[illegible]

**Ambient Test Conditions:**

	Air Temp.	Water Temp.	Wind Dir.	Wind Spd	Cloud Cover	Rainfall (in.)
Tank	79°F	78.5°F	WSW	9 MPH	N/A	N/A
-						

30914  
812  
8/27/95



Weather  
Stat.

See "TANK"

Notes on Significant Occurrences:

FAST SIDE REMAINING ROPE BROKE DURING TEST 4 (WTRJET 3. PMN) 8/23/95  
4:00 PM

Reported To: Observed & corrected by Test Eng & Test Conductor with TONY LORENZO

Action Taken: Replaced with new heavier line. 8/23/95 4:00 PM

Significant Occurrences / VariationsTest Run No: TEST 4 Run # WIRJET 3. PRUDescription of Occurrence / Variations: Rope broke on east side Helium "Y"  
in shapeReported by: TEST DIRECTOR / TESTER / Time: 2:50 PM Date: 8/23/95  
GT Eng + J. ThompsonAction taken: Replaced Rope with heavier one + RERAN TEST (TEST 4A)Taken by: JLB Time: 2:50 Date: 8/23/95Post Test Conditions

## Weather Conditions:

	Time	Verified by	Date
Air temperature	<u>79°F</u>	<u>JLB</u>	<u>8/23/95 3:10 PM</u>
Water temperature	<u>79.5°F</u>	<u>JLB</u>	<u>8/23/95 3:10 PM</u>
Wind speed	<u>9 MPH</u>	<u>JLB</u>	<u>8/23/95 3:10 PM</u>
Wind direction	<u>48°</u>	<u>JLB</u>	<u>8/23/95 3:10 PM</u>
Water salinity	<u>14.8 per thousand</u>	<u>JLB</u> <u>14.8 per thousand</u>	<u>8/23/95 3:10 PM</u>

# QUALITY ASSURANCE CHECKLIST

2ND TEST DAY

PROJECT: Water Jet Barrier

PROJECT No: 915

Date: 8/24/95

## PRETEST CONDITIONS:

## CALIBRATION CHECKS / VERIFICATION:

	Calibrated	Verified By	Date
Bridge Speed	<u>5/16/95</u>	<u>DAB</u>	<u>8/24/95</u>
Bridge distance	<u>5/16/95</u>	<u>DAB</u>	<u>8/24/95</u>
Wave frequency	<u>5/16/95</u>	<u>DAB</u>	<u>8/24/95</u>
Wave height probe	<u>5/16/95</u>	<u>DAB</u>	<u>8/24/95</u>
Oil tank level	<u>5/16/95</u>	<u>DAB</u>	<u>8/24/95</u>
Water Jet SPD (if used)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

## WEATHER CONDITIONS

	Time	Verified by	Date
Air temperature AM	<u>8:00</u>	<u>DAB</u>	<u>8/24/95</u>
Water temperature AM	<u>8:00</u>	<u>DAB</u>	<u>8/24/95</u>
Wind speed AM	<u>8:00</u>	<u>DAB</u>	<u>8/24/95</u>
Wind direction AM	<u>8:00</u>	<u>DAB</u>	<u>8/24/95</u>
Water salinity AM	<u>8:00</u>	<u>DAB</u>	<u>8/24/95</u>

	Time	Verified by	Date
Underwater Camera Operational	<u>8:15 AM</u>	<u>DAB</u>	<u>8/24/95</u>
Above Water Camera Operational	<u>8:15 AM</u>	<u>DAB</u>	<u>8/24/95</u>
Test Setup Per Test Plan	<u>8:15 AM</u>	<u>DAB</u>	<u>8/24/95</u>

WATER JET BARRIER QUALITY CHECKLISTDaily ChecklistDate 8/24/95 (if performed on various days, use separate checklist for each date)Pretest Conditions:\*

	<u>Air Temp.</u>	<u>Water Temp.</u>	<u>Wind Dir.</u>	<u>Wind Spd</u>
Tank	<u>73°</u>	<u>77.1°F</u>	<u>244°</u>	<u>13</u>

8:00 AM  
D.L. Barker

\* Indicate observation data, time, and individual recording date (initials)

Camera Operational:

	<u>Verified By</u>	<u>Date</u>	<u>Time</u>
Video:	<u>Donald L. Barker</u>	<u>8/24/95</u>	<u>8:15 AM</u>

	<u>Verified By</u>	<u>Date</u>	<u>Time</u>
Still:	<u>Donald L. Barker</u>	<u>8/24/95</u>	<u>8:15 AM</u>

Instrument Test Conditions:

<u>Instrument:</u>	<u>Verified By</u>	<u>Date</u>	<u>Time</u>
1. Bridge Speed	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
2. Bridge Dist.	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
3. Wind Speed	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
4. Wind Direction	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
5. Ambient Temp.	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
6. Tank Water Temp.	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
7. Tank Level	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
8. WH Sonic Probe	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
9. Wave CPM	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
10. Marker 1	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
11. Pump RPM	<u>DLB</u>	<u>8/24/95</u>	<u>2:25 PM</u>
12. Water Jet (FPM)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

### Test Conditions

	Data	Observed by	Time	Date
Bridge Speed	WTRJET 8	Mike NARR	11:45 AM	8/24/95

Note Measuring Method: OBSERVED Computer Bridge operator's console readout

### Water Pressure

	Data	Observed by	Time	Date
Meter Readings	WTRJET 6.000	MIKE NARR	9:19 AM	8/24/95
	WTRJET 7.000	MIKE NARR	10:53 AM	8/24/95
	WTRJET 8.000	MIKE NARR	11:04 AM	8/24/95
	WTRJET 9.000	MIKE NARR	2:23 PM	8/24/95
	WTRJET 10.000	MIKE NARR	2:47 PM	8/24/95
	WTRJET 11.000	MIKE NARR	3:38 PM	8/24/95

Recorded on a chart by Mike NARR

Note: Take Duplicate Samples for characteristics and run three Reps.  
(See comments on Section 2.1.6)

	Data	Observed by	Time	Date
Oil Used:	HYDRAULIC 300	Mike NARR	2:23 PM	8/24/95
	HYDRAULIC 310	Mike NARR	2:47 PM	8/24/95
	HYDRAULIC 300	Mike NARR	3:38 PM	8/24/95
Quantity:	46 gal	Mike NARR	2:23 PM	8/24/95
	146 gal	Mike NARR	2:47 PM	8/24/95
	100 gal	Mike NARR	3:38 PM	8/24/95

Wave Conditions:

[illegible]

**Ambient Test Conditions:**

	Air Temp.	Water Temp.	Wind Dir.	Wind Spd	Cloud Cover	Rainfall (in.)
Tank	90°F	78.9°F	312°	16 mph	N/A	N/A

Weather  
Stat.

see "TANK"  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Notes on Significant Occurrences:

DURING WARTJET 11. PPN PUMP WOULD NOT WORK ON CUSTOMER'S UNIT  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reported To: TEST Eng, TEST Conductor, <sup>DRS</sup> R. Eng. Tony Lawrence

Action Taken: Pump was checked out a fusible valve was put on the INTAKE SUCTION hose. - TEST TO be repeated tomorrow (8/25/78) morning.

Significant Occurrences / VariationsTest Run No: WATER TEST 11, PRAI TEST 1.2Description of Occurrence / Variations: see description on previous  
pageReported by: Test Eng, Test Cond. Time: 3:38 PM Date: 8/24/95  
QA Eng / Tony LorezoAction taken: see description under ACTION TAKEN on  
page 22Taken by: N/A Time: N/A Date: N/APost Test Conditions

## Weather Conditions:

	Time	Verified by	Date
3:45 PM Air temperature	90°F	<u>[Signature]</u>	8/24/95
Water temperature	78.90°F	<u>[Signature]</u>	8/24/95
Wind speed	16 MPH	<u>[Signature]</u>	8/24/95
Wind direction	312°	<u>[Signature]</u>	8/24/95
Water salinity	14.8 ‰ (Parts/Thous.)	<u>[Signature]</u>	8/24/95



# QUALITY ASSURANCE CHECKLIST

*Final Test Day (3rd Test Day)*

PROJECT: Water Jet Barrier

*8/25/95 Friday*

PROJECT No: 915

*Donell L. Backus  
QA Engineer*

Date: 8/25/95

## PRETEST CONDITIONS:

## CALIBRATION CHECKS / VERIFICATION:

	<u>Calibrated</u>	<u>Verified By</u>	<u>Date</u>
Bridge Speed	<u>5/16/95</u>	<u>DLB</u>	<u>8/25/95</u>
Bridge distance	<u>5/16/95</u>	<u>DLB</u>	<u>8/25/95</u>
Wave frequency	<u>5/16/95</u>	<u>DLB</u>	<u>8/25/95</u>
Wave height probe	<u>5/16/95</u>	<u>DLB</u>	<u>8/25/95</u>
Oil tank level	<u>5/16/95</u>	<u>DLB</u>	<u>8/25/95</u>
Water Jet SPD (if used)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

## WEATHER CONDITIONS

	<u>Time</u>	<u>Verified by</u>	<u>Date</u>
Air temperature	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>
Water temperature	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>
Wind speed	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>
Wind direction	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>
Water salinity	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>

	<u>Time</u>	<u>Verified by</u>	<u>Date</u>
Underwater Camera Operational	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>
Above Water Camera Operational	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>
Test Setup Per Test Plan	<u>8:00 AM</u>	<u>DLB</u>	<u>8/25/95</u>

WATER JET BARRIER QUALITY CHECKLISTDaily ChecklistDate 8/25/95 (if performed on various days, use separate checklist for each date)Pretest Conditions:\*

8:00 AM  
JLB Air Temp. Water Temp. Wind Dir. Wind Spd  
 Tank 69°F 76.4°F 46° 13 MPH

\* Indicate observation data, time, and individual recording date (initials)

Camera Operational:

Video: JLB 8/25/95 8:20 AM  
           Verified By           Date           Time  
 Still: JLB 8/25/95 8:20 AM  
           Verified By           Date           Time

Instrument Test Conditions:

<u>Instrument:</u>	<u>Verified By</u>	<u>Date</u>	<u>Time</u>
1. Bridge Speed	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
2. Bridge Dist.	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
3. Wind Speed	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
4. Wind Direction	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
5. Ambient Temp.	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
6. Tank Water Temp.	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
7. Tank Level	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
8. WH Sonic Probe	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
9. Wave CPM	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
10. Marker 1	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
11. Pump RPM	<u>JLB</u>	<u>8/25/95</u>	<u>8:25 AM</u>
12. Water Jet (FPM)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

Test Conditions

	Data (TST 13A)	Observed by	Time	Date
Bridge Speed	65 K. JET 72 P.T.	DRB	8:25 AM	8/25/95

Note Measuring Method: observed computer readout on console computer

Water Pressure

	Data	Observed by	Time	Date
Meter Readings	Recorded on chart by hand BY M. Pol. DRR IN MAIN BRIDGE	MIKE NORR	8:25 AM	8/25/95

Note: Take Duplicate Samples for characteristics and run three Reps.  
(See comments on Section 2.1.6)

	Data	Observed by	Time	Date
Oil Used:	Hypro 300	DRB	8:20 AM	8/25/95
Quantity:	100 gal			



Weather  
Stat.

Sec "TANK"

Notes on Significant Occurrences:

none today

Completed test in AM & started cleaning & parking of WATER TET BARRIER UNIT

Observed by:

D. L. Buckner

Reported To:

Action Taken:

N/A

Significant Occurrences / Variations

Test Run No: N/A  
 Description of Occurrence / Variations: N/A on this  
TEST DAY

Reported by: N/A Time: N/A Date: 8/25/95  
 Action taken: NONE (NOT) REQUIRED

Taken by: DAP Time: 8:30 AM Date: 8/25/95

Post Test ConditionsWeather Conditions:

	Time	Verified by	Date
Air temperature	3:45 PM 79°F	DAB	8/25/95
Water temperature	3:45 PM 77.9°F	DAB	8/25/95
Wind speed	3:45 PM 8 MPH	DAB	8/25/95
Wind direction	3:45 PM 354°	DAB	8/25/95
Water salinity	3:45 PM 14.8	DAB	8/25/95

(PPTP  
Per Thousand)